DOCUMENT RESUME

ED 240 341 CE 038 251

TITLE	Energy Conservation for Residential Dwellings. Course Syllabus.
INSTITUTION	Bergen County Vocational-Technical High School, Hackensack, N.J.
SPONS AGENCY	New Jersey State Dept. of Education, Trenton. Div. of Vocational Education and Career Preparation.
PUB DATE	May 83
NOTE	24p.; For related documents, see CE 038 249-253.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Competence; *Conservation Education; Continuing Education; *Course Content; Curriculum; Curriculum Guides; *Energy Conservation; Heat; *Heating; *Housing; Job Skills; *Job Training; Maintenance; Postsecondary Education; Repair; Solar Energy; Technical Education; Trade and Industrial Education
IDENTIFIERS	Bergen County Vocational Technical Schools NJ; Insulation

ABSTRACT

This course is one of four in a solar systems and energy management program developed by the Bergen County Vocational-Technical Schools to help tradespeople (heating, ventilation, and air conditioning mechanics; plumbers; and electricians) to develop an awareness of alternate energy sources and to gain skills in the areas of solar installations and energy evaluation and management. The format of the course is a combination of lectures, visual presentations, handouts, and shop sessions. Upon completion of the course, the student will be expected to be able to insulate a ceiling or wall and to install gasketing that prevents drafts around doors and windows. In addition, the student should understand the economics of larger repairs or improvements to a heating system and be able to determine whether or not such repairs are cost effective. Following introductory materials that explain the purpose and conduct of the course, the course syllabus contains six units. Each unit consists of an outline, objectives, note to the instructor, and/or shop session notes. The units cover the following topics: introduction and orientation, heat and methods of conservation, locations where conservation can take place, solutions to heat loss problems, heating units, and energy efficient additions to a home. The competencies that students are expected to acquire are listed at the end of the syllabus. An appendix contains handouts about insulation techniques and materials. (KC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED240341

not NCC

BERGEN COUNTY TECHNICAL SCHOOLS
200 Hackensack Ave.
Hackensack, New Jersey 07601

COURSE SYLLABUS

COURSE TITLE:

ENERGY CONSERVATION FOR RESIDENTIAL DWELLINGS

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

LF Price

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CE038251

May, 1983

ENERGY TECHNOLOGY DEPARTMENT

AL BRUNNER, LEAD TEACHER

Trade Extension Division
Bergen County Technical Schools
200 Hackensack Avenue
Hackensack, New Jersey 07601

COURSE SYLLABUS

COURSE TITLE:	ENERGY CONSERVATION FOR RESIDENTIAL DWELLINGS
LENGTH OF COURSE:	16 HOURS
COURSE DESCRIPTION:	This course assists home dwellers to understand energy and how it can be conserved. Insulation, gasketing, and improvements to a heating unit are among the topics covered in this course. The class concludes with a presentation of the advantages of a passive addition to a residence.

OVERVIEW OF THE ADULT ENERGY TECHNOLOGY PROGRAM

The Energy Technology Program for adults consists of technical training courses offered exclusively by the Bergen County Vocational-Technical Schools and a college-credit certificate program offered in conjunction with Bergen Community College.

Technical training courses offered through this school include Heating, Air Conditioning and Refrigeration, Oil Burner Technician Training, Blueprint Reading and Estimating for the HVAC Trades, Sheet Metal Layout and a new program in Solar Systems and Energy Management. In addition to these part-time technical training programs, the School operates a full-time, intensive training program for HVAC mechanics.

The new solar program is designed for tradespeople (HVAC mechanics, plumbers, electricians) to help them develop an awareness of alternate energy sources such as solar and to gain skills in the areas of solar installations and energy evaluation and management.

INTRODUCTION TO COURSE

The purpose of this course is to provide knowledge to the student/ home dweller about energy conservation, its importance, and how to properly achieve this goal as economically as possible in a domestic setting.

The requirements for entrance into this course are a desire to learn, the ability to work with basic hand tools, and the capability to do basic high school level algebra.

The course prepares the student with knowledge to make energy conservation improvements to a home. The class format is a combination of lectures, visual presentations, hand-outs and shop sessions.

Upon completion of this course, the student will be able to properly insulate a ceiling or wall, and to install gasketing which prevents drafts around doors and windows. In addition, the student will understand the economics of larger repairs or improvements to a heating system and will be able to determine whether or not such repairs are cost effective.

INSTRUCTIONAL METHODS

A combination of instructional methods will be utilized. Lecture will be supplemented by demonstrations, teacher-prepared handouts and visual aids, including slides, 16mm film and/or overhead projections as may be appropriate to the instructional unit. "Hands-on" shop sessions are designed to reinforce theory, to provide students with job-simulated experiences, and to expose students to equipment utilized in the field.

CLASS REQUIREMENTS

Students will be expected to come prepared for class by completing reading and other homework assignments. Students will be expected to take notes in class and to study in a manner conducive to successful performance on tests and quizzes.

STUDENT EVALUATION AND GRADING

The exact procedure for grading will be the decision of the individual instructor; however, the following guidelines will be adhered to:

1. A written midterm and final examination covering all material presented in the course will be administered and evaluated.
2. An average of six quizzes will be administered and evaluated periodically during the course.
3. Shop/laboratory exercises will be evaluated.
4. Attendance and attitude will be evaluated.
5. Final grade will reflect the aggregated evaluation of the above.

UNIT I: INTRODUCTION AND ORIENTATION

Unit Outline:

A. Overview of the Adult Energy Technology Program
B. Introduction to Course
    1. Description and purpose of course
    2. Pre-requisite requirements
    3. Projected outcomes for students who successfully complete course
        a. Anticipated learning
        b. Job preparation
    4. Class requirements
    5. Instructional methods
    6. Student evaluation and grading policy
C. Safety Regulations (as per district policy)
    1. Proper use of shop equipment
    2. Safety goggles
    3. Clothing
    4. Body mechanics
    5. Emergency procedures in case of accident
D. Fire Information
    1. Fire extinguishers
    2. Fire drills and safe exit from building
E. Smoking Policy
F. General Information for Students
        a. Parking
        b. Book purchase
        c. Breaks
        d. Class cancellation
        e. Certificate of course completion

Unit Objectives:

Upon completion of this unit, the student will be able to:

1. Develop an overview of the adult Energy Technology program.

2. Develop a clear understanding of the course, including its purpose, requirements for entrance, projected outcomes, class requirements, methods of instruction, evaluation and grading.

3. Explain and demonstrate safe use of shop equipment.

4. Explain when and why safety goggles are to be utilized.

5. Identify acceptable and unacceptable clothing as related to shop safety.

6. Define the term "body mechanics."

7. Describe the benefits of using good body mechanics in the shop and demonstrate same.

8. Explain the procedure to be followed in case of accident.

9. Identify any combustible materials in the shop and select the proper extinguishing agent(s).

10. Explain the color and letter markings on various fire extinguishers.

11. Demonstrate the proper handling and safety precautions to be used with extinguishers.

12. Demonstrate the fire emergency procedure of the school.

13. Identify the smoking regulations of the school.

14. Review school policy in terms of parking, class breaks, purchase of books, cancellation of class, and certificate requirements upon completion of course.

NOTE TO INSTRUCTOR:

Consult the district Safety Education Program manual (Fall, 1981) for policy and practice relative to general safety regulations, fire information, and smoking policy.

UNIT II: HEAT AND METHODS OF CONSERVATION

Unit Outline:

A. Energy
    1. Definition
    2. Forms of energy
    3. Explanation of the way each form of energy acts.
B. Heat: Definition
C. Movement of Heat
    1. Conduction
    2. Convention
    3. Radiation
D. Energy Costs
    1. Past
    2. Present
    3. Future
E. Oil
    1. Domestic
    2. Foreign
F. Alternatives to traditional energy consumption.
    1. Conservation
    2. Solar and renewable energy sources
    3. Utilization of less expensive energy sources.

Unit Objectives:

Upon completion of this unit, the student will be able to:

1. Define energy and explain how it does work in several different forms.

2. Understand the nature of heat.

3. Explain how heat can move through solids, air mass, or space.

4. State the costs of fuel in the past and project the future of energy costs.

5. Understand the problems of the northeast relating to imported oil.

6. Identify alternatives to high energy costs, highlighting conservation and utilization of less expensive energy sources such as solar.

Unit III: LOCATIONS WHERE CONSERVATION CAN TAKE PLACE

Unit Outline:

A. Windows
    1. Seams
    2. Panes
B. Doors
    1. Seams
    2. Thermal Break
    3. Insulation
C. Walls and Ceilings
    1. Cracks
    2. Insulation
D. Foundation

Unit Objectives:

Upon completion of this unit, the student will be able to:

1. Locate heat loss from leaky windows.
2. Identify a heat loss problem in several different types of doors.
3. Name the types of wall and ceiling conservation used today and list the positive and negative aspects of each type.
4. Explain how heat is lost through a foundation and name the different types of foundations in current use.

Unit III Shop Session

Students will tour several local school buildings (or homes) and note where heat is wasted. Teacher will issue handout #H-25 (c.f. Appendix) for the session.

Unit IV: SOLUTIONS TO HEAT LOSS PROBLEMS

Unit Outline:

A. Windows
    1. Weatherstripping
    2. Caulking
    3. Double glazing
    4. Storm windows
    5. Thermal Breaks
B. Doors
    1. Weatherstripping
    2. Double-glazed windows
    3. Thermal break frame
    4. Foam insulated units
    5. Gasketing
C. Walls and Ceilings
    1. Types of insulation
        a. Batts
        b. Loose Fill (Rock wool, Cellulose Fiber)
        c. Blown In
        d. Rigid Board
    2. Insulation Board
    3. Location of Electrical Outlets
    4. Vapor Barrier
    5. R-Facturs of Common Types of Insulation
D. Foundation and Crawl Spaces
    1. Location of Insulation
    2. Methods of Insulating
E. Caulking cracks
    1. Lead Base Caulking Material
    2. Latex Caulking Material
    3. Silicone Caulking Material

Unit Objectives

Upon completion of this unit, the student will be able to:

1. Install suitable weatherstripping on a drafty window to reduce heat loss.
2. List the differences between a energy efficent door and a "Energy Waster"; be able to make repairs or improvements to reduce heat loss from a door.
3. Describe the various types of wall and ceiling construction and be able to install insulation in a wall or ceiling.
4. Install insulation properly in a crawl space or foundation to lessen heat loss through floors.
5. Identify the different types of caulking and the advantages and disadvantages of each type.

Unit IV Shop Session

Students will practice installation of weatherstripping and insulating fill in various locations to conserve energy.

Unit V: HEATING UNITS

Unit Outline:

A. Types
    1. Gas
    2. Oil
    3. Electric
B. Thermostats
    1. Programmable
    2. Set-Back, Set-Up
C. Humidity
D. Improvements
    1. Installation of more efficient burner
    2. Adjustment of Firing Rate
    3. Installation of more efficient system
    4. Zoning of a heating system
    5. Balancing of a system
    6. Conversion from steam to hot water
    7. Installation of heat reclaimers
E. Economics
    1. Cost vs. Payback
    2. Tax Credits
    3. Energy Savings

Unit Objectives:

Upon completion of this unit, the student will be able to:

1. List the types of heating systems and explain how each works.
2. Describe how a set-back or set-up thermostat can save money and energy.
3. Understand why proper humidity is important to maintain comfortable conditions in a living space.
4. Name seven different methods for improving the efficiency of a home heating system.
5. Explain how a improvement can "Pay for Itself" by saving the homeowner money through fuel and also by qualifying for tax credits.

Unit V Shop Session:

Students will tour the heating shop and observe efficient and non-efficient heating units during operation. In addition, students will practice calculation of the cost and payback of a heating system conversion. Teacher will utilize handouts # 46-B and #46-D (c.f. Appendix).

Unit VI: ENERGY EFFICIENT ADDITONS TO A HOME

Unit Outline:

A. Passive Design Location (Southern Exposure)
B. Location of indoor rooms
C. Window location
    1. Types of glass panes to be utilized
    2. Summer shading
D. Thermal Storage
    1. Masonry
    2. Water
E. Movable Insulation
F. Summer cooling
    1. Roof Ponds
    2. Windows and vents

Unit Objectives:

Upon completion of this unit, the student will be able to:

1. Summarize the factors to be considered when designing an energy efficient addition.
2. Identify the ideal location of inside rooms within a passive area.
3. Provide a description of appropriate window locations.
4. Describe the types of thermal storage which can be used in a passive addition.
5. Understand the function and importance of movable insulation in a solar greenhouse.
6. Explain the highlights of solar cooling and the function of air vents or roof ponds.

Units VI Shop Session

Shop for Unit VI will include a tour of several solar greenhouses at the Paramus Campus. Students will identify system components and describe how each functions in a passive system.

COURSE PROFICIENCIES

Note: Proficiencies (sometimes referred to as "tasks" or "competencies" in the field of education) are defined as those skills acquired by a student that make he or she employable in a vocational or technical trade. Proficiencies are interpreted to mean applied, practical knowledge, i.e., those skills for which an employer would be willing to pay wages. While unit objectives may reflect learning theory as well as practical skills, the proficiencies refer exclusively to salable skills.

Students who complete this course are expected to achieve the following proficiencies:

1. Work safely in a simulated work environment by consistently demonstrating proper safety measures with regard for themselves, for other people, and for equipment and tools. Develop an understanding of the overall energy situation and relate the projected effect of costs and future fuel supplies upon the homeowner.

2. Locate heat loss throughout a dwelling including windows, doors, ceiling, walls and foundations.

3. Determine proper corrective action to halt heat loss in a dwelling.

4. Be able to install door gasketing, caulking, and various types of insulation to help prevent heat loss.

5. Explain the primary functions of a heating unit and the various types of fuels which are used; demonstrate understanding of heating units and fuel as they relate to efficiency of operation.

6. Calculate whether or not a heating unit repair, improvement or replacement is cost worthy.

7. Demonstrate understanding of the purpose and design of a passive addition and why it should be considered as a home addition.

APPENDIX

(Handouts)

Insulation Value of Common Materials..... H-20

R-Valuse for Common Insulation Materials..... H-21

Home Energy Conservation Plan..... H-25

Get a Check-Up From Ypur Certified Technician 46-B

Available Options..... 46-B - 46-C

Do it Yourself..... 46-D

Insulation Value of Common Materials

MATERIAL	THICKNESS (inches)	R VALUE
Air Film and Spaces:		
Air space, bounded by ordinary materials	¾ or more	.91
Air space, bounded by aluminum foil	¾ or more	2.17
Exterior surface resistance	—	.17
Interior surface resistance	—	.68
Masonry:		
Sand and gravel concrete block	8	1.11
	12	1.28
Lightweight concrete block	8	2.00
	12	2.13
Face brick	4	.44
Concrete cast in place	8	.64
Building Materials — General:		
Wood sheathing or subfloor	3/4	1.00
Fiber board insulating sheathing	3/4	2.10
Plywood	5/8	.79
	1/2	.63
	3/8	.47
Bevel-lapped siding	1/2 x 8	.81
	3/4 x 10	1.05
Vertical tongue and groove board	3/4	1.00
Drop siding	3/4	.94
Asbestos board	1/4	.13
3/8" gypsum lath and 3/8" plaster	3/4	.42
Gypsum board (sheet rock)	3/8	.32
Interior plywood panel	1/4	.31
Building paper	—	.06
Vapor barrier	—	.00
Wood shingles	—	.87
Asphalt shingles	—	.44
Linoleum	—	.08
Carpet with fiber pad	—	2.08
Hardwood floor	—	.71

Source: Project Retro-Tech

R-Values for common insulation materials

	Batts or Blankets		Loose and Blown Fill*				
R-Value	glass fiber	rock wool	glass fiber	rock wool	cellulose fiber	vermiculite	perlite
R-11	3½ in.	3 in.	5 in.	4 in.	3 in.	5 in.	4 in.
R-13	4	3½	6	4½	3½	6	5
R-19	6	5	8½	6½	5	9	7
R-22	7	6	10	7½	6	10½	8
R-26	8	7	12	9	7	12½	9½
R-30	9½	8	13½	10	8	14	11
R-33	10½	9	16	11	9	15½	12
R-38	12	10½	17	13	10	18	14

Source: DOE Insulation Fact Sheet

Home Energy Conservation Plan

Instructions: The question numbers on this form correspond to those on the Home Energy Inspection. For those areas where you have identified preventable heat loss, indicate the weatherization measures which are appropriate, what materials are required, an estimate of the cost and if you can do the job yourself. When the form is completed, you will have an energy and money saving plan for your own home.

Example:

HEAT LOSS AREA IDENTIFIED		WEATHERIZATION MEASURES REQUIRED	SUGGESTED MATERIALS	APPROX. COST	DO-IT YOURSELF
QUESTION #	AREA				
1.	WINDOWS	Weatherstrip windows in kids' room, entry, den and back hall	sides: spring metal tops and bottom: adhesive backed foam (closed cell)	$3-5 per window	X

HEAT LOSS AREA IDENTIFIED		WEATHERIZATION MEASURES REQUIRED	SUGGESTED MATERIALS	APPROX. COST	DO-IT YOURSELF
QUESTION #	AREA				
I. INFILTRATION					
A. COLD AIR ENTERING HOUSE					
1.	WINDOWS				
2.	DOORS				
3.	WALLS (Penetration)				

HEAT LOSS AREA IDENTIFIED		WEATHERIZATION MEASURES REQUIRED	SUGGESTED MATERIALS	APPROX. COST	DO-IT YOURSELF
QUESTION #	AREA				
4.	WALLS (Siding)				
5.	WALLS (Electrical Outlets)				
6.	AROUND FOUNDATION				
B. WARM AIR ESCAPING					
7.	ATTIC ENTRY				
8.	THERMAL BYPASSES				

HEAT LOSS AREA IDENTIFIED		WEATHERIZATION MEASURES REQUIRED	SUGGESTED MATERIALS	APPROX. COST	DO-IT YOURSELF
QUESTION #	AREA				
9.	THERMAL BYPASSES				
II. CONDUCTION					
10.	STORM WINDOWS				
11.	STORM DOORS				
12.	ATTIC/ROOF INSULATION				
13.	WALL CAVITY INSULATION				
14.	FLOORS OVER CRAWLSPACES INSULATION				
15.	BASEMENT WALLS INSULATION				

Get a check-up from your certified technician.

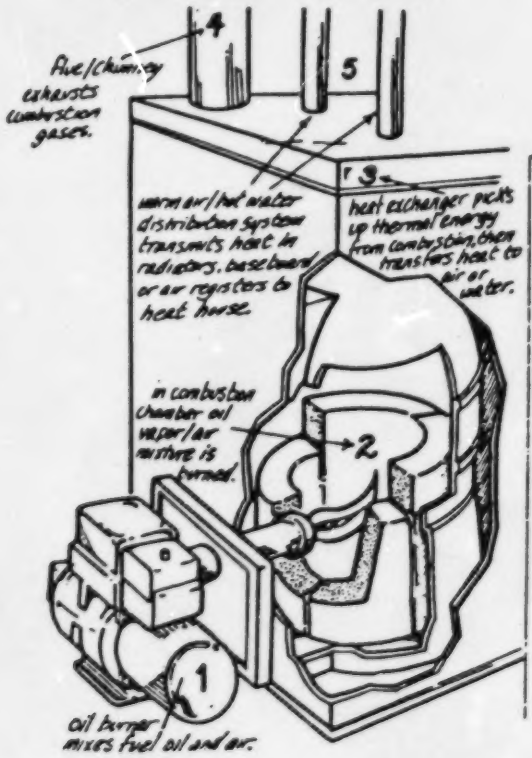
To accurately gauge your oil heating system's efficiency, a tune-up may be in order. Make sure that the tune-up is done by a certified oil burner technician, using accurate test equipment. To help you understand what a tune-up involves, you may request that the technician check the corresponding box as each category on the list below is attended to.

- ☐ Clean soot from the heat exchanger. Clean the fan. Change the oil filter and air filter. Check unit for leaks.
- ☐ Measure smoke density. Too much smoke means inefficient combustion.
- ☐ Measure the amount of air draft within the combustion chamber (overfire draft) and in the flue (breech draft). This shows the amount of air available for combustion.
- ☐ Measure the carbon dioxide or oxygen level in the flue. Low carbon dioxide or high oxygen levels indicate inefficient combustion.
- ☐ Measure the net stack temperature. It tells how much heat is being lost up the chimney.
- ☐ The technician then should compute your system's inefficiency. It should be no lower than 70% for systems with conventional burners and no lower than 75% for systems with flame-retention burners. If your system doesn't measure up, you are spending too much on fuel and should consider replacing or modifying your heating system.

Insist that the certified oil burner technician complete the "before" test report form attached to this brochure. The report is a record of your system's efficiency.

Upon request, retail oil companies participating in a program sponsored by the Massachusetts Energy Office and the U.S. Department of Energy in cooperation with the Better Home Heat Council will provide you with the following: 1) a detailed evaluation* of your home heating system that includes the results of a scientifically conducted efficiency test along with basic information that all homeowners should know about their heating systems; 2) a written recommendation based on your system's evaluation, relating to the fuel-saving and money-saving options appropriate for you. The recommendations should quote both the cost and the estimated annual savings associated with any heating system improvements you invest in.

*Some dealers may charge a fee for this evaluation.


4
5
3
2
1
flue/chimney exhausts combustion gases.
warm air/hot water distribution system transmits heat in radiators, baseboard or air registers to heat house.
heat exchanger picks up thermal energy from combustion, then transfers heat to air or water.
in combustion chamber oil vapor/air mixture is formed.
oil burner mixes fuel oil and air.

Available options.

If your oil heating system isn't burning as efficiently as it should, your oil heat dealer is qualified to make the energy-saving modifications listed below.

Options 1, 2, and 3 are generally accepted as proven energy savers, while options 4–7 have not been extensively tested but may represent significant potential savings.

1. Install new burner.

If your burner is more than 10 years old, you should consider buying a new, high-speed, flame retention-type oil burner. Such a burner, with its firing rate optimized, can increase your system's efficiency by as much as 25%. Cost is in the $400 range. Consult your oil company to determine if you already have a high-speed, flame-retention burner, or if your system could benefit from one.

2. Optimize firing rate.

It may surprise you to learn that the greater the percentage of time your furnace is on, the more efficient it is! Tests have clearly shown that furnaces that burn oil slower, for longer periods of time, use much less oil than furnaces that burn oil fast, for short periods. Therefore, it may be worthwhile to reduce the rate at which your burner consumes oil (the firing rate). Typically, firing rate reduction costs about $100 and can increase system efficiency and reduce oil expenditure by about 10%. Consult your oil heat dealer.

3. Replace burner-boiler or burner-furnace system.

If your system is more than 10 years old, you might benefit substantially from a totally new furnace or boiler system.

Source: Massachusetts Energy Office

Available options. (cont.)

Because of many recent improvements in heating system design, a new system can boost efficiency by as much as 30%. Consult your oil company to determine if your entire system should be replaced. The initial cost may range from $1000 to $3000.

4. Clock thermostats.

These devices cost from $50 to $150 and can pay for themselves in a few heating seasons. They automatically lower the thermostat temperature setting (usually 5°F or more) for a specified time period, e.g., 8 hours. You can save as much as 6% on your annual fuel costs in this manner. The same savings can be realized if you remember to set back the thermostat manually each night during the heating season. Consult your oil dealer, since not all systems can use a clock thermostat.

5. Zoning, balancing.

Zoning establishes two or more heating zones within your home that can be controlled by separate thermostats. If some rooms can be kept cooler than others, you may benefit from zoning. Balancing adjusts the flow of water, steam or hot air through radiators, vents and ducts so that the heat is distributed throughout the house more evenly. Although balancing is usually cheaper than zoning, it is not nearly as effective in reducing heating costs. For unused rooms, shutting off the heat and closing the doors can also save. Consult your heating service company for feasibility and cost information.

6. Convert from steam to forced hot water.

If you have a steam system, you should consider converting to more efficient forced hot water. It is often easy to convert, with costs in the $1,000 range. Efficiency increases of up to 18% have been obtained. Consult your oil company to see if converting your system is worthwhile.

7. New devices.

New energy-saving devices are continuously coming on the market. Flue dampers and stack-heat reclaimers are still in the testing stage, but some models are already available commercially. Your oil company can discuss these and other new devices with you.

Efficiency improvements estimated here are based on limited field studies, experiments and analyses under specialized conditions. Actual efficiencies achieved may vary widely from those stated. Prices are approximate and will vary with location, competitive situation and requirements of local building codes.

The chart below describes the cost and projected savings of each of these modifications.

The following options are generally accepted as proven energy savers.

Option	Initial Cost**	Average Increase in Efficiency	Average Savings*** Per $1,000 Spent on Oil	Additional Maintenance Required	Typical Payback Period (years)
•New Burner (High speed flame retention type) with optimized firing rate	$ 300-400	10-25%	$100-250	none	3
•Firing Rate Optimization	70-100	10%	$100	none	1½
•New System (Burner/Boiler or Burner/Furnace)	$1000-3000	30%	$300	minimal	11

* Consult your oil company

** Prices compiled in Spring 1978.

The following options have not been extensively tested but may represent significant potential savings.

Option	Initial Cost**	Average Increase in Efficiency	Average Savings*** Per $1,000 Spent on Oil	Additional Maintenance Required	Typical Payback Period (years)
•Clock Thermostats	$ 50-150	5%	$ 50	some	3½
•Zoning and Balancing	*	*	*	some	*
•Conversion of Steam systems to hot water	$1000+	15%	$150	minimal	12
•Flue Dampers	$150-250	7%	$ 70	some	5
•Stack Heat Reclaimers	$100-200	5%	$ 50	some	5

*** Savings associated with individual options are not cumulative, and will vary in accordance with heating habits and other factors.

How much will you save?

Before work starts on your heating system improvements or modifications, have your oil company determine the K factor for the unmodified system. Record this on the "before" chart.

After the modifications, have your oil company again determine your system's K factor. Record this on the "after" chart. If your K factor has increased by 10% for example, you can be reasonably sure that you are saving about 10% of your fuel bill.

For meaningful results, the two K-factor determinations should be made over long periods of time such as one entire heating season. The weather should be similar for each period, and your heating habits should not change (e.g., same thermostat settings).

The next time your oil heating system is tuned up, have the technician record its efficiency rating on the "after" chart. Keep the chart for a permanent record of your system's efficiency.

Before: Test Report Form

The following test results are based upon measurements of your heating system performed on _____ (date).

Efficiency (%) _____ Poor 60–70 | Fair 70–80 | Good 80–90 | Excellent

Smoke _____ Acceptable 0–2 | Unacceptable 2–6

CO_2 (%) _____ Poor 6–8 | Fair 8–10 | Good 10–12 | Excellent 12–14

OR

O_2 (%) _____ Excellent 2–4 | Good 4–6 | Fair 6–8 | Poor 8–12

Net Stack Temperature (°F) _____ Excellent 300–400 | Good 400–500 | Fair 500–600 | Poor 600–800

Overfire Draft ("H_2O) _____

Breech Draft ("H_2O) _____

_____ Certified Technician

_____ Massachusetts certificate number

K factor _____ Name of Oil Dealer _____

After: Test Report Form

The following test results are based upon measurements of your heating system performed on _____ (date).

Efficiency (%) _____ Poor 60–70 | Fair 70–80 | Good 80–90 | Excellent

Smoke _____ Acceptable 0–2 | Unacceptable 2–6

CO_2 (%) _____ Poor 6–8 | Fair 8–10 | Good 10–12 | Excellent 12–14

OR

O_2 (%) _____ Excellent 2–4 | Good 4–6 | Fair 6–8 | Poor 8–12

Net Stack Temperature (°F) _____ Excellent 300–400 | Good 400–500 | Fair 500–600 | Poor 600–800

Overfire Draft ("H_2O) _____

Breech Draft ("H_2O) _____

_____ Certified Technician

_____ Massachusetts certificate number

K factor _____ Name of Oil Dealer _____

Source: Massachusetts Energy Office

Do it yourself.

Be aware of how often your heating system comes on and turns off. To decide if you firing rate is too high, monitor the furnace's performance during a very cold winter's nigh If it's off for more than 50% of the time, it's possible that the firing rate can be reduced. On some units, however, hot water requirements or system design interfere with attemp to cut firing rates.Consult your oil company.

Keep radiators, registers and dust filters clean. Your heating service technician will show you how.

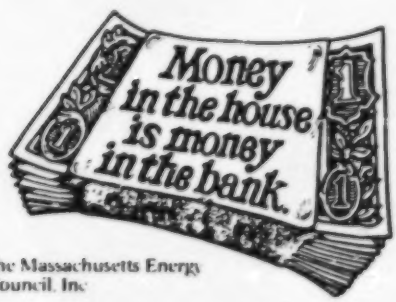
Keep the furnace area clean and free from pets. Hair and accumulated lint can plug the air inlet.

Make note of strange noises, smells or "too-hot" areas in your system. Report them to your oil company.

Report smelly or smokey flue exhausts to your oil company.

Are there any oil leaks in your system?

Make sure carpeting, drapes, and furniture don't obstruct air flow in baseboards, registers or other areas of ventilation.



This information booklet was produced by the Massachusetts Energy Office in cooperation with the Better Home Heat Council, Inc

Source: Massachusetts Energy Office